


**Presentation 9 – Michael Kilpatrick**




## Medical Research in DoD

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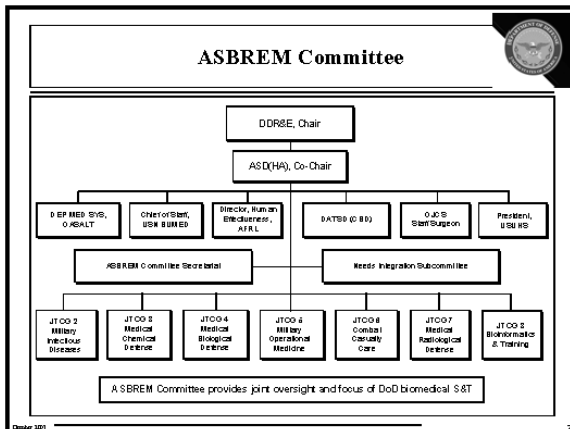



### Scope of Program

- Development of knowledge base for technology to preserve the health and mission capability of military personnel.
- Enablers for the Military Health System, Force Health Protection initiatives, and deployment health.
- Subareas:
  - Infectious Diseases of Military Importance.
  - Military Operational Medicine.
  - Combat Casualty Care.
  - Medical Radiological Defense.
  - Medical Informatics and Training. (New thrust area)
  - Medical Chemical and Biological Defense.\*

\*Medical Chemical & Biological Defense is programmed and executed under separate authority (PL 103-160).

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### Biomedical S&T: Selected Accomplishments

- Hepatitis E vaccine moved to advanced development.
- Live, quadrivalent dengue vaccine moved to advanced development.
- Licensure of new antimalarial drug.
- Demonstration of visual performance with laser eye surgery.
- Enhancement of fighter pilot training and safety through fatigue avoidance.
- Reduction of spatial disorientation with situational awareness system.
- 10-week red cell storage solution moved to advanced development.
- Fibrin bandage moved to advanced development.
- Frozen blood processing system moved to advanced development.
- Hand-held dental x-ray system fielded by Army.
- Quantified radioprotective efficacy of 5-androstenediol in small rodent.
- Developed safety/toxicity profiles of 5-AED in large animal model.
- Identified promising new radioprotectant compound.
- Demonstrated method of blocking GI radiation injury.

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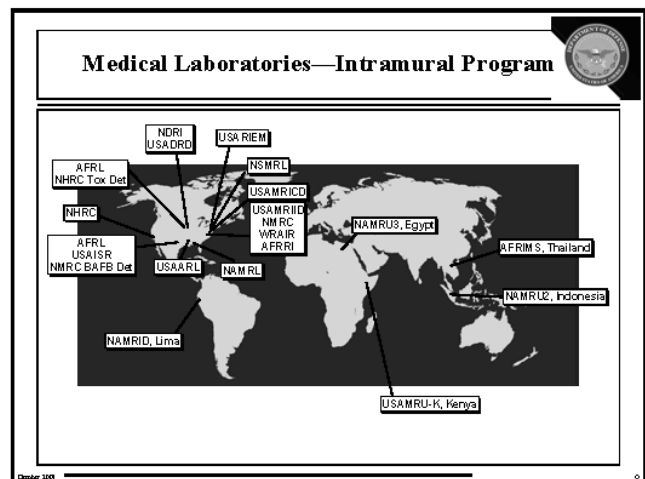
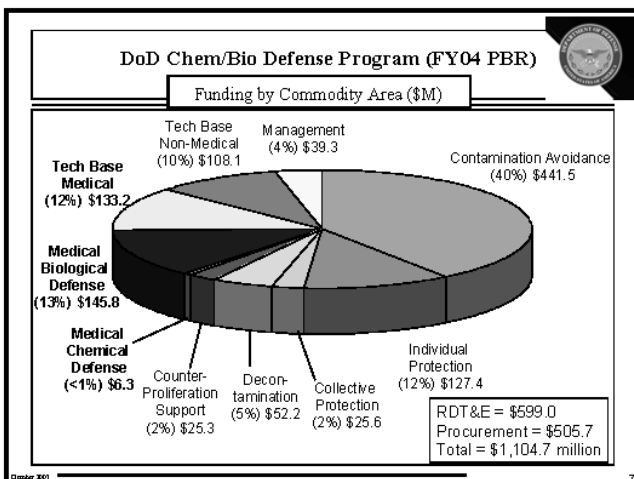
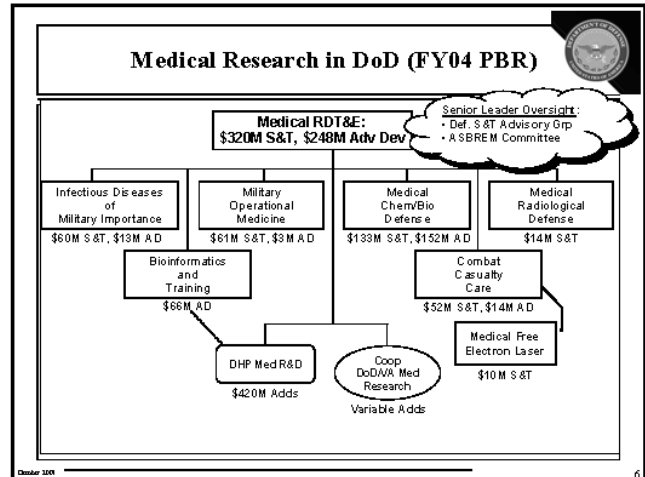
### Acquisition/Warfighting Needs



- Preparedness for regional conflict.
- Preventive medicine.
- Life-saving treatment, resuscitative care, and stabilization.
- Rapid evacuation to CONUS-based facilities.
- Improved logistics and communications.
- Enhanced personnel readiness for joint and combined operations.
- Theater Medical Health System information technology.
- Tactical-to-strategic surveillance.



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### Infectious Diseases of Military Importance




- Investment: \$60M S&T, \$13M Adv Dev ('04 PBR).
- Infectious disease can influence the outcome of military operations through:
  - Morbidity
  - Mortality
  - Morale disturbance
  - Use of resources
- 30+ potential infectious disease threats to US forces have been identified.
- Primarily addresses diseases that have impacted military operations.

Starburst callouts: Malaria, Diarrheal Diseases, Dengue, Vector Control/Mitigation, Diagnostics.

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### Combat Casualty Care




- Investment: \$52M S&T, \$14M Adv Dev ('04 PBR)
- Since mid-WWII, 50% of combat deaths have been due to hemorrhage.
  - Half could have been saved through timely, appropriate care.
  - Ability to rapidly locate, diagnose, treat & monitor during transport is vital.
- Providing care with a reduced logistics footprint is key.

Starburst callouts: Fibrin Bandages, Freeze-dried Platelets, Smart Tourniquet, Resuscitative Fluids, Pneumothorax Detector.

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### Medical Radiological Defense




- Investment: \$14M S&T ('04 PBR)
- Need to prevent ionizing radiation injuries in nuclear/radioactive operational environments.
- Need for prophylactic and treatment protocols.
- Need for knowledge of combined NBC risks.
- Need for casualty prediction models.
- Need for biological dosimetry to guide triage and treatment.
- Use of depleted uranium munitions requires assessment of toxicity and development of treatment strategies.

Starburst callouts: Radiation Protectants, Deployable Biodosimetry, Cytogenic Assays.

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### Medical Chemical/Biological Defense



- Investment: \$133M S&T, \$152M AD ('04 PBR)
- Provide medical solutions for military requirements to protect and sustain the force in a chemical and/or biological warfare environment
- Preserve total warfighter effectiveness on a CW/BW battlefield:
  - Prevent casualties
  - Provide effective treatment of casualties for rapid return to duty
  - Provide rapid, far-forward diagnosis of CW/BW disease.

Starburst callouts: Vaccines/pretreatments, Diagnostic tests and reagents.

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### Bioinformatics and Training

- Investment: \$66M AD ('04 PBR)
- Leverages MOM & CCC efforts.
- Surveillance systems to collect and monitor data for disease trends and/or outbreaks.
- Point-of-care PDA for medical reporting and treatment/diagnostic assistance.
- Joint patient DNBI accounting.
- Integration of environmental biosensors, medical surveillance, & communications systems.
- Define, refine & transition technologies & CONOPS that significantly increase responsiveness in consequence management, crisis response, deterrence & intelligence coordination.

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### Military Operational Medicine

- Investment: \$61M S&T, \$3M Adv Dev ('04 PBR)
- Enhance performance for combat success.
- Produce large savings in care and lost duty time.
- Prevent catastrophic injury or failure.
- Save on development of materiel and doctrine.
- Understand consequences of stressors & threats.
- Includes Force Health Protection Research Program (follow-on to GWI Research Program).

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### Force Health Protection Research Program

- GWIRP was retitled FHPRP in 1999 at request of Assistant Secretary of Defense (Health Affairs) to reflect broader program scope:
  - Shift from retrospective to prospective research.
  - Greater emphasis on prevention.
- Builds on lessons learned from 1991 Gulf War; targets solutions to problems which may arise in future deployments.
- Stimulates forward-looking research to improve force medical protection.
- Links intramural and extramural researchers to bolster intramural science capabilities and to increase extramural institutional interest in military medical research problems.
- Program supported by tri-Service advisory panel; all research receives independent peer review.
- Funding: ~\$10M/year.

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### FHPRP Science Roadmap

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### FHPRP Mission Focus

**OCCUPATIONAL EXPOSURES**

- Fuel vapors
- Combustion products (e.g., vehicles)
- Oil well fire smoke
- Altitude
- Sand
- Heat/old
- Munitions fragments



- Traumatic events
- Anxiety
- Boredom
- Family separation
- Reunion
- Health behaviors

*Warfighters are rarely subjected to one stressor at a time yet little research pre-Gulf War had evaluated interactions relevant to military operational environments*

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### FHPRP Current Investment Focus

- **Global Health Monitoring:** methods to follow health status from recruitment through deployment and into VA system.
- **Health Behavior Interventions:** strategies to modify health risk factors (alcohol, tobacco, weight, STDs, unintended pregnancy) that affect military readiness.
- **Health Risk Communication:** assessment of various methods of providing health risk information.
- **Health Risk Assessment:** identification of environmental risks important to post-deployment health.
- **Medical Materiel Safety:** improved safety testing of medical materiel before use in environments where deployment stressors may produce unanticipated effects.

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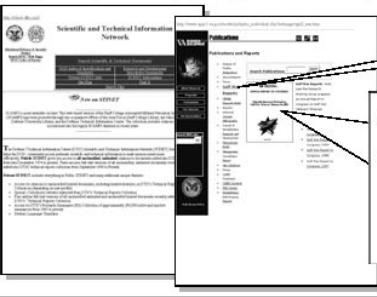

### FHPRP Items of Potential Multi-agency Interest

- Millennium Cohort Study: Long-term, longitudinal collection of data on deployment health from 100,000 service members.
- Studies of neurobehavioral associations and Gulf War symptoms are discovering general mechanisms linking adversity and health outcomes.
- Center for Deployment Health will pioneer methods to monitor post-deployment health of specific military populations.
- Detailed data collection has been initiated for all casualties evacuated out of Afghanistan.
- Follow up will be conducted on patients with embedded depleted uranium.
- The Chem/Bio Defense Program continues to address low-level nerve agent exposure.

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### Gulf War Illnesses Research Information Sources

- <http://stinet.dtic.mil>
- [http://appc1.va.gov/resdev/prt/pubs\\_individual.cfm/webpage=gulf\\_war.htm](http://appc1.va.gov/resdev/prt/pubs_individual.cfm/webpage=gulf_war.htm)

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### FHPRP: Selected Accomplishments



- Developed and established DoD Birth Defects Registry for early identification of associations with occupational and deployment exposures.
- Developed diagnostic skin test for Leishmania infection (transitioned to advanced development).
- Discovered apparent absence of blood/brain barrier effect, which is being further evaluated in operational stress conditions.
- Classified some undiagnosed Gulf War veterans' illnesses with symptoms and physiological changes that overlap chronic multi-symptom illnesses (Chronic Fatigue Syndrome and Fibromyalgia).
- Discovered carcinogenic potential of large fragments of imbedded depleted uranium in laboratory animals.
- Discovered new brain stress mechanisms and specific new drug interventions that may be useful in adapting to stress during combat and for modification of adverse health consequences from high-stress conditions.
- Developed test method for squalene antibodies that is being applied to sera of deployed & non-deployed veterans to determine associations with symptoms of illness.
- Discovered potential adverse effects of the administration of multiple vaccines during high stress conditions.

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### Military Medical Technology Forecast



- Novel vaccines for debilitating and life-threatening infectious diseases.
- Individual protective equipment based on new understanding of human biomechanics.
- Mobile and flexible life support for long-range evacuation.
- Operational doctrine and ration supplements to improve and sustain operational capability.
- Strategies to protect against ionizing radiation.
- Prediction and prevention of performance degradation and injury.
- Diagnostic and treatment systems for forward medics.
- Novel products for self and buddy control of hemorrhage.
- Advanced treatments for laser eye injury.
- Methods to assess individual psychological stress limits.
- Exposure biomarkers that are sensitive, specific, and easy to use; that can determine personnel exposure; and that can predict health consequences.
- Biologically based health-risk-assessment methods.

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### Key to Abbreviations (1 of 2)



- AD: Advanced Development
- CCC: Combat Casualty Care
- CONOPS: Concept of Operations
- CONUS: Continental United States
- Coop DoDVA Med Res: Cooperative DoDVA Medical Research Program
- CW/BW: Chemical Warfare/Biological Warfare
- DHP: Defense Health Program
- DNBI: Disease Non-Battle Injury
- GWI: Gulf War Illnesses
- MOM: Military Operational Medicine
- PBR: President's Budget Request
- PDA: Personal Digital Assistant
- RDT&E: Research, Development, Test & Evaluation
- S&T: Science & Technology (basic & applied research)

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### Key to Abbreviations (2 of 2): Laboratories



- AFRIMS: Air Force Research Institute of Medicine
- AFRL: Air Force Research Laboratory
- AFRRI: Armed Forces Radiobiology Research Institute
- BAFB Det: Brooks Air Force Base Detachment
- NAMRL: Naval Aerospace Medicine Research Laboratory
- NAMRU: Naval Medical Research Unit
- NDRI: Naval Dental Research Institute
- NHRC Tox Det: Naval Health Research Center, Toxicology Detachment
- NMRC: Naval Medical Research Center
- NSMRL: Navy Submarine Medicine Research Laboratory
- USAARL: US Army Aeromedical Research Laboratory
- USADR: US Army Dental Research Detachment
- USAISR: US Army Institute of Surgical Research
- USAMRICD: US Army Medical Research Institute of Chemical Defense
- USAMRIID: US Army Medical Research Institute of Infectious Diseases
- USAMRU: US Army Medical Research Unit
- USARIEM: US Army Research Institute of Environmental Medicine
- WRAIR: Walter Reed Army Institute of Research

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